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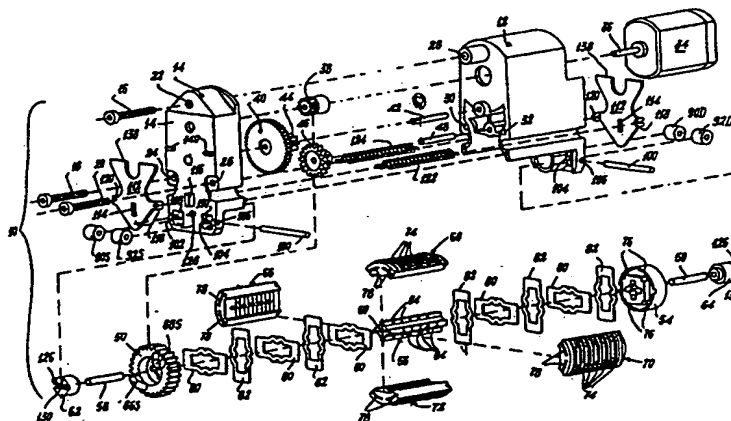
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(54) Title: HAIR REMOVER



(57) Abstract

The air remover comprises a roller (52) projecting for an appropriate angular extension or its side surface from a window provided in a shell of the hair remover. The roller is rotated by an electric motor (34) and is mounted on a hub (56) constrained to rotate in relation to the roller. The latter translates cyclically in both directions in relation to the hub and has at least two series of angularly equally spaced slits (74) with the slits parallel to a plane perpendicular to the hub. On the hub is fixed a series of plates (80, 82) for each series of slits. The plates when at rest are also parallel to a plane perpendicular to the hub and extend radially thereto outward. The plates are elastically deformable perpendicularly to their plane with the outermost edge of the plates of each series facing associated slit of one of the series of slits. The amplitude of the cyclic translation of the roller in relation to the hub is such as to bend the plates so that each of them exerts on the edge of the associated slit with which it comes in contact a gripping force desired when the associated series of slits is opposite the window.

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Hair remover

DESCRIPTION

Technical field

The present invention relates to hair removers, i.e.
5 those small apparatuses to be gripped which serve to eliminate superfluous hair.

Background art

FR-A 2556939 describes a hair remover comprising moving members for tearing out hairs to be eliminated and driven
10 by an electric motor housed inside a containment shell designed to be held in the hand. The tearing members consist of a series of discs arranged nearby and having a small distance between them and forming a turning roller arranged behind a slot, a grate or the like provided in
15 the hair remover shell, and means designed to ensure periodic gripping against disks of the hairs arranged between them so that said hairs are pulled by the discs and torn out following rotation of the latter.

For our purposes interest lies especially in the
20 embodiment of the hair remover illustrated in FIGS. 7, 8, 9 and 10 of the above mentioned document showing a hair remover in which the means designed to ensure periodic gripping of the hairs consist of two opposed assemblies comprising each a series of basically rigid blades
25 parallel and equidistant and each co-operating with a portion of the periphery of one of said discs.

Disclosure of the invention

The purpose of the present invention is to provide a hair
remover which would be simpler and less costly than the
30 above described hair remover.

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Another purpose of the present invention is to provide a hair remover which would act simultaneously as a vibrating massage apparatus.

5 The first above mentioned purpose is achieved thanks to the hair remover in accordance with the present invention comprising a roller projecting for an appropriate angular extension of its side surface from a window provided in a shell of the hair remover with the roller being rotated by an electric motor and being mounted on a hub
10 constrained to rotate in relation to the roller and characterised in that the roller translates cyclically in both directions in relation to the hub and has at least two series of angularly equally spaced slits and the slits being parallel to a plane perpendicular to the hub
15 and on the hub there being fixed a series of plates for each series of slits and the plates when at rest being also parallel to a plane perpendicular to the hub and extending radially thereto outward and the plates being elastically deformable perpendicularly to their plane and
20 the outermost edge of the plates of each series facing an associated slit of one of the series of slits and the amplitude of the cyclic translation of the roller in relation to the hub being such as to bend the plates so that each of them exerts on the edge of the associated
25 slit with which it comes in contact a gripping force desired when the associated series of slits is opposite the window.

As may be readily understood, the hair remover in accordance with the present invention is particularly
30 simple and robust and hence also less costly than the known hair removers. In particular, in a preferred embodiment with four series of slits, the hair remover is capable of performing four grippings per rotation of the roller, thus allowing for an equal number of rotations of

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the electric motor and number of gripping means per series a maximum hair removing speed (the maximum speed of movement of the hair remover on the skin for which the hair remover is still capable of performing its function) at least double that of the known hair removers, which perform not more than two grippings per revolution.

In the above mentioned embodiment of the hair remover with four series of slits, if it is assumed that with the hair remover operating and for the series of slits which pass in the hair remover window the gripping takes place following the pressure which one of the two sides of a generic slit exerts on the associated plate, it will be convenient that for the subsequent series of slits which pass in the window the gripping take place by pressure against the associated plate of the corresponding side of a generic slit opposite that of the previous series of slits against which rests the associated plate.

Because of unavoidable machining tolerances, it may happen that not all the plates of the same series exert the same gripping force and it may also happen that some plates do not exert a gripping force sufficient to tear out the hairs.

To avoid occurrence of this shortcoming the movement of the roller in both directions is greater than a theoretical minimum which would be necessary if the parts were perfect, i.e. with zero tolerance. The amount of the overrun depends on the established tolerances and there are provided elastic reaction means which act axially on the hub which bears the roller and which intervene to prevent that the total axial force exerted by the roller on the plate exceeds a predetermined value.

Such a provision permits not only having each plate exert

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a gripping force not less than a minimum value necessary to ensure eradication of the gripped hairs but also fixing rather large machining tolerances, which is reflected beneficially in production costs. This also
5 permits avoiding yielding of the plates and eliminating or at least reducing substantially the deleterious effects of fatigue with considerable lengthening of the life of the hair remover.

The hair remover in accordance with the present invention
10 permits also achievement of the other purpose mentioned above of the present invention. Indeed, by providing means which confer on the roller a tripped reciprocating translating movement, it is possible to obtain a vibrating effect so that the hair remover functions
15 simultaneously as a vibrating massage apparatus. The above mentioned means for obtaining the vibrating massage effect can be simple stepped cams.

Brief description of drawings

The characteristics and advantages of the method in
20 accordance with the present invention are set forth in the description of an embodiment thereof given below by way of non-limiting example with reference to the annexed drawings wherein -

FIG. 1 shows an exploded axonometric view of a
25 hair remover with four series of slits and without the outer shell,

FIG. 2 shows a longitudinal cross section in a median vertical plane with the plates of the lower slit series falling into the window of the hair remover when
30 in their rest condition,

FIG. 3 shows an end view of the plate-holder hub

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with two series of double plates mounted on them and there being visible in the figure also in an exploded view the four parts making up the roller ready to be mounted on the hub,

5 FIG. 4 shows a side view of only the hub with associated plates and there being also visible in the figure the relief mechanism for the excess pressure of the plates on the roller,

10 FIGS. 5 to 10 show (in the lower part) for six different angular positions the cross section of the assembly made up of the roller and hub with plates and (in the upper part) the corresponding angular positions of the cams commanding the gripping action,

15 FIG. 11 shows the gripping diagrams exerted by the edge of two generic consecutive plates angularly offset by 90 degrees,

FIG. 12 shows a longitudinal cross section of only the roller and hub assembly with the plates in the left gripping position, and

20 FIG. 13 is analogous to the above but with the plates in the right gripping position.

Best mode for carrying out the invention

The hair remover will have a conventional outer shell of dimensions such as to make the hair remover graspable.
25 Said shell is not shown for the sake of simplicity in the FIGS.. It should enclose all the mechanisms visible in FIG. 1 and exhibit a window from which should protrude an appropriate angular extension of the side surface of the above said roller so that the gripping of the hairs to be
30 stripped may take place.

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In FIG. 1 it is seen that the hair remover 10 comprises a first plastic casing part 12 and a second casing part 14 of the same material with the two parts 12 and 14 being connectable together by means of the screws 16,18,20 insertable in corresponding threaded holes 22,24,26 and 28,30,32 respectively.

In the first casing part 12 is supported an electric motor 34 on whose shaft 36 is keyed a pinion 38 which meshes with a first gear wheel 40 keyed on a shaft 42 and integral with a second pinion 44 with which it is coaxial. The latter meshes in turn with a second gear wheel 46 keyed on a shaft 48. The above mentioned pinions and gear wheels 38,40,44,46 are contained in the second casing part 14 and serve, in addition to transmitting rotary movement of the shaft 36 of the electric motor 34 to a toothed bush 50 which meshes with the second gear wheel 46, also to reduce appropriately the rotary speed of the electric motor 34. As is seen better below, the toothed bush 50 can translate alternately in both directions for a certain distance parallel to the shaft 48 of the second gear wheel 46. Therefore the thickness of the toothed bush 50 and of the related teeth should be such as to allow meshing with the second gear wheel 46 whatever its position in the related translation range.

The toothed bush 50 is integral in rotation with a roller 52 (visible also in FIGS. 5 to 10, 12 and 13), delimiting its left end, while the right end of the roller 52 is delimited by a bush 54 also integral in rotation with the roller 52. The latter consists of four parts as seen better below and is mounted on a coaxial hub 56 (better seen in FIG. 4), the roller being integral with the latter in rotation but able to translate cyclically in both directions in relation to the hub 56 thanks to a

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coupling of a form analogous to that between the hub 56 and the two end bushes 50 and 54 (as seen in FIG. 1), which cannot either rotate in relation to the hub 56 while they can translate thereon with the roller 52.

- 5 The hub 56 is supported by a shaft 58 insertable in a bore 60 coaxially provided in the hub 56 with the latter being able to rotate and also translate in both directions for a certain distance in relation to the shaft 58. The two ends of the shaft 58 are supported by
10 two bushes 62 and 64 in turn supported in special housings provided in said two parts 12 and 14 respectively of the casing.

As may be seen better in FIGS. 1 and 3 the roller 52 consists of four equal sectors 66,68,70,72 having one
15 outer face basically curved and the four outer faces of said sectors once mounted on the hub 56 forming altogether a cylindrical surface. The four sectors 66,68,70,72 are blocked against rotation on the hub 56 following mounting on the hub of the two end bushes 50
20 and 54 whose four side ribs 76 which are arcs of a circle (of which only those of the bush 54 are seen in FIG. 1) join with corresponding arched grooves 78 (of which in said figure there are seen only those joinable with the lateral ribs, not shown, of the toothed bush 50.

- 25 The above said cylindrical surface of the roller 52 exhibits four series of slits 74 parallel and angularly equally spaced, a series for each of the sectors 66,68,70,72. On the hub 56 are fixed two series of double metallic plates arranged centrally in relation to
30 the axis of the hub 56 and perpendicular to the latter. Each series is made up of five double plates 80 and 82 respectively, the plates of one series being rotated 90° to those of the other series and the first being placed

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alternately between the others. The two end edges of each double plate face an associated slit without protruding.

5 The plates 80,82 exhibit a central opening formed in such a manner as to permit assembly thereof on the hub 56, which takes place by merely fitting the plates onto the above hub and rotating them by 45 degrees so that each plate is blocked in its position on the hub thanks to the presence thereon of four series of five radial notches
10 84.

As may be seen in FIG. 1 the toothed bush 50 exhibits on its outer face two cams 86S and 88S diametrically opposed and designed to engage with two rollers 90S and 92S arranged in respective windows 108 and 110 provided in
15 the second casing part 14. Said rollers rotate on a shaft 100 supported in coaxial holes 102,104,106 provided in the second casing part 14.

Even the bush 54 exhibits two cams (not shown in FIG. 1) indicated by 86D and 88D and identical with those of the
20 toothed bush 50 but angularly staggered by 90° to the cams 86S,88S engageable with related rollers indicated by 90D,92D also born by a shaft (100) supported in associated holes in which are visible those indicated by 104 and 106.

25 On the vertical outer face of each of the two casing parts 12 and 14 is rested a respective metallic plate 112 which exhibits a window 114 in which is inserted a protuberance 116 projecting from said vertical face.

Each of the two plates 112 exhibits two small ears
30 118,120, the ears 118 and the ears 120 of each plate being interconnected by respective helical springs 122 and 124.

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As may be seen again in FIG. 1 each of the two bushes 62,64 exhibits on a face thereof turned outward a cylindrical projection 126 which, with the bush mounted on the respective casing part, projects outward through a bore (of which is visible in FIG. 1 only that in the second casing part 14 and indicated by 128, provided in the vertical wall of the related casing part. The free end of the cylindrical projection 126 rests against the plate 112 near the lower end of the latter.

FIG. 1 shows that the bushes 62 and 64 exhibit a horizontal groove 130 which permits passage of the shaft 100. It is noted however that the purpose of said groove is not to receive the shaft 100 but to prevent that in any situation during operation the latter rest against the associated bush.

There is now described operation of the hair remover 10 recalling that the parts shown in FIG. 1 are actually contained in a shell (not shown) exhibiting a lower window of rectangular shape from which projects for a certain angular extension the side surface of the roller 52 preferably for an angular extension around 90 degrees.

To understand the operation of the hair remover 10 reference is made especially to FIGS. 5 to 10 and FIG. 11. In particular in the lower part of FIG. 5 is shown a cross section of the roller 52 and associated hub 56 which bears the plates 80 and 82, the section being made opposite a generic plate 82. Said section represents the situation in which the rollers 90S,92S begin to come into contact with the associated cams 86S,88S.

As seen in FIG. 1 the above said cams are formed from an inclined surface part 128 and a part 134 with surface parallel to the plane of the associated toothed bush 50.

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- The upper part of FIG. 5 shows the angular position of the cams 86S and 88S in relation to the rollers 90,92 as well as that of the cams 86D and 88D of the opposing bush 54. The position of the still undeformed plates 82 in the associated slits 74 is not centred in the associated slit, there being therein in this specific case 0.8mm between the median plane of the plate and the right side of the slot 74 and 0.4mm between the median plane thereof and the left side of the slit.
- 10 With reference to FIG. 11 and in particular to diagram a) in which the vertical line P indicates the position of the undeformed median plane of the plate 82 while the vertical lines Q and R represent the position of the left side and the right side respectively of the associated
- 15 slit of width A and the position of the point of intersection of a vertical plane V-V passing through the axis of the roller 52 and the associated lower edge of the plate 82 identified on the diagram a) by the point 1L. In the same diagram 1U identifies the corresponding
- 20 position of the point of intersection between the upper edge of the plate 82 and the plane V-V with said upper edge not being active since the associated slit is not opposite the above mentioned window of the shell (not shown) which the point 1L faces.
- 25 Following rotation of the electric motor 34 whose speed is appropriately reduced thanks to the presence of the gear train 38,40,44,46 and 50, the line V-V will intersect the lower edge of the plate 82 at point 2L and the upper edge thereof at point 2U as shown in the lower
- 30 part of FIG. 6, the angular position of the associated cams 86D and 88D being that shown in the high part of said figure with the line V-V coinciding with the corner 132 thereof which separates the section of cam with inclined surface 128 from the section thereof with

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surface parallel to the plane of the associated bush. The corresponding point on the diagram a) of FIG. 11 is that indicated by 2L while 2U identifies the analogous point on the opposite edge of the plate. As may be seen in diagram a), in reaching point 2L the plate 82 first comes in contact with the associated side (line R) of the slot 74 undergoing a first move of 0.8mm in relation to the roller 52 and then an elastic deformation or preloading of 0.4mm designed to ensure sufficient gripping force on the hair falling between the plate 82 and the side R of the slot 74 so as to ensure its extirpation.

Continuing in the rotation of the roller 52 it is found in the situation shown in FIG. 7 and identified by the points 3L and 3U on the diagram a) of FIG. 11. As seen in the upper part of FIG. 7 the line V-V coincides with the corner 136 of the cams 86D and 88D. Continuing in the rotation of the roller 52 the gripping effect ceases and the plate is detached from the side R of the slit. The diagram a) is shown in broken lines because no longer of interest for the purposes of hair gripping, the associated edge of the plate no longer facing the window of the shell.

Still continuing with rotation of the roller 52 there now faces the window an end of the plate 80 (in broken lines in FIGS. 5 to 10) until reaching the situation of FIG. 8 which is analogous to that of FIG. 5 for the plate 82, the associated point 1L being found in diagram b) of FIG. 11 with the only difference being that the plate 80 is elastically deformed in the direction opposite that of the plate 82. Rotation continues as explained for FIGS. 9 and 10 and diagram b).

The result is that for each pair of plates 80, 82 there

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are performed four grippings per 360-degree revolution.

As mentioned above the gripping effect is made possible by the fact that the roller 52 translates cyclically in both directions in relation to the hub 56 which bears the
5 plates. To avoid that, because of inevitable imperfections in the component parts involved of the hair remover, the plates be exposed to excessive stresses during the preloading or overrun phases, there is provided a stress limiting device comprising the
10 pretensioned springs 122 and 124 as well as the two plates 112. Indeed, by appropriately calibrating said springs, once a certain maximum stress is reached, caused by the elastic deformation of the plates 80,82, it happens that the associated head of the hub 56 presses
15 laterally against the corresponding bush (62 or 64 depending on the direction of movement of the roller). The cylindrical projection 126 of the latter presses in turn against the lower end of the associated plate 112 which makes a small rotation basically around its upper
20 edge 138 which rests against two projections 140 provided on the vertical external face of the associated casing part (12 or 14). This rotation of the plate 112 brings simultaneous axial shifting of the hub 56 (together with the roller 52) in relation to the shaft 58 preventing
25 further increase of stress on the plates.

Such a device for limiting stress on the plates also allows provision of involved parts of the hair remover with rather large tolerances which make it significantly
lest costly to manufacture.

30 The stress limiting device described above can be adjustable. For this purpose it suffices to provide a means of adjustment of the pretension of the springs 122 and 124 and, more generally, preloading of the elastic

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reaction means of the above limiting device.

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CLAIMS

1. Hair remover comprising a roller projecting for an appropriate angular extension of its side surface from a window provided in a shell of the hair remover with the roller being rotated by an electric motor and being mounted on a hub constrained to rotate in relation to the roller and characterised in that the roller is translatable cyclically in both directions in relation to the hub with the roller having at least two series of slits and the series of slits being spaced angularly and mutually equidistant and said slits being parallel to a plane perpendicular to said hub and there being fixed on the hub a series of plates for each series of slits and said plates also being when at rest parallel to a plane perpendicular to the hub and extending radially therefrom outward and the plates being elastically deformable perpendicular to their plane and the outermost edge of the plates of each series facing an associated slit of one of the series of slits and the range of the cyclic translation of the roller in relation to the hub being such as to bend the plates so that each of them exerts on the edge of the associated slit with which it comes in contact a desired gripping force when the associated series of slits is opposite said window.
2. Hair remover in accordance with claim 1 in which the series consists of four slits.
3. Hair remover in accordance with claim 2 in which the plates of one series of slits perform the gripping resting on one side of the slit and in the subsequent series of slits the gripping takes place on the opposite side of the associated slit.
4. Hair remover in accordance with any of the above

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claims in which the roller is made up of four sectors each of which exhibits a series of slits.

5. Hair remover in accordance with claim 4 in which are provided two series of double plates with the plates of one series rotated 90 degrees in relation to those of the other series and those of one series being between and alternating with the others.

6. Hair remover in accordance with claim 5 in which the plates exhibit a central opening conformed so as to permit mounting thereof on the hub with the blocking in position of the plates after fitting them on the hub taking place following one rotation thereof by engagement with associated blocking means provided on the hub.

7. Hair remover in accordance with any of the above claims in which is provided a device for limiting the stress exerted by the plates on the roller and comprising preloaded elastic reaction means acting between the hub and the casing axially to the hub which bears the roller and permitting shifting of the hub together with the roller when the total axial force exerted by the roller on the plates exceeds a pre-set value.

8. Hair remover in accordance with claim 7 in which is provided a means of adjustment of the elastic reaction preloading means for the device limiting stress on the plates.

9. Hair remover in accordance with any of the above claims in which are provided means conferring on the roller a reciprocating tripping translating movement.

10. Hair remover in accordance with claim 9 in which the means for conferring on the roller a tripping movement are stepped cams.

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INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A45D26/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A45D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	FR,A,2 680 652 (BRAUN) 5 March 1993 see page 19, line 1 - page 22, line 36; figures 5,5A	1,2,7-10
X	---	1,9
A	FR,A,2 675 354 (SEB) 23 October 1992 see page 4, line 4 - page 7, line 22; figures 1-5	6,8-10

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

28 March 1995

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Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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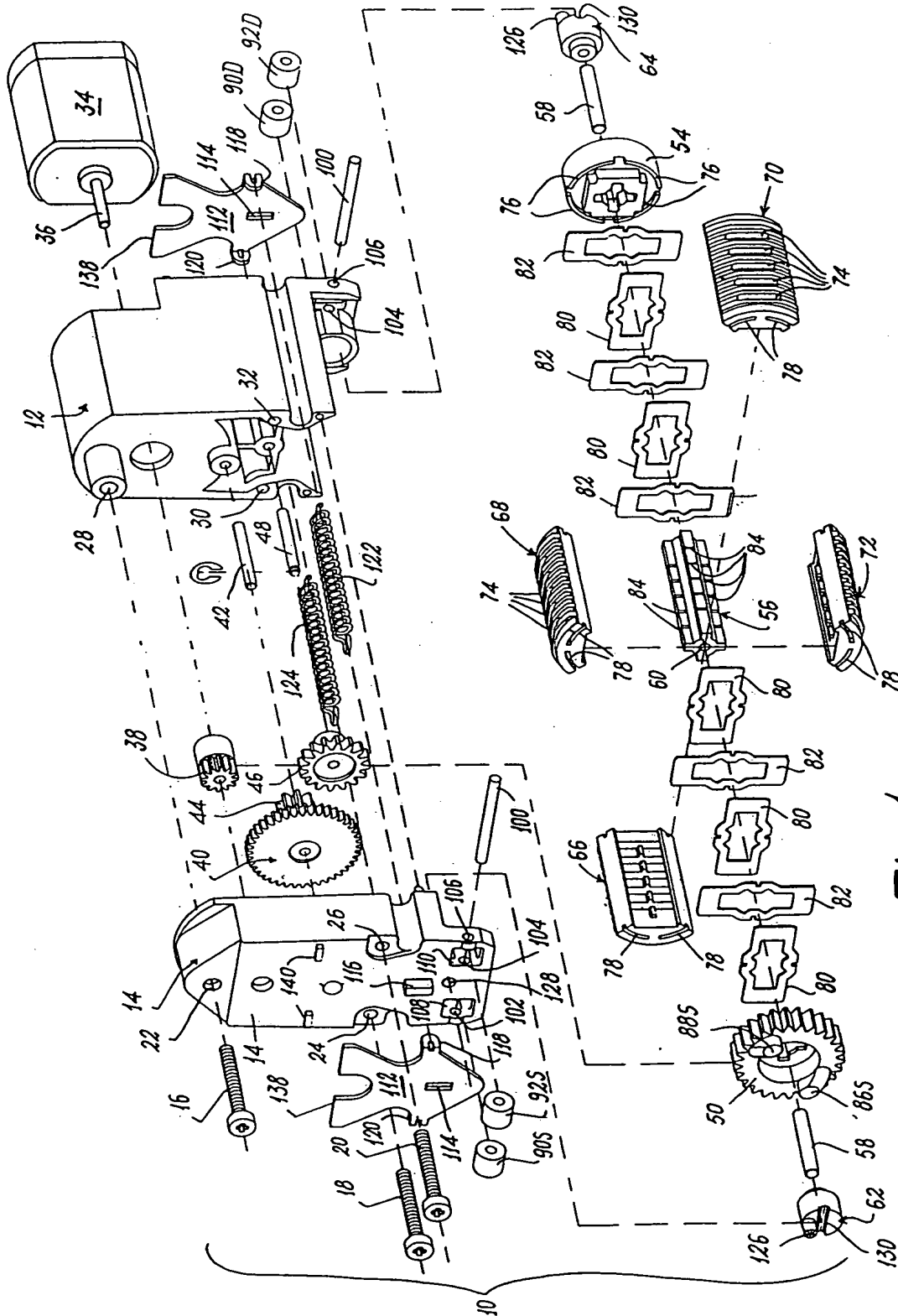
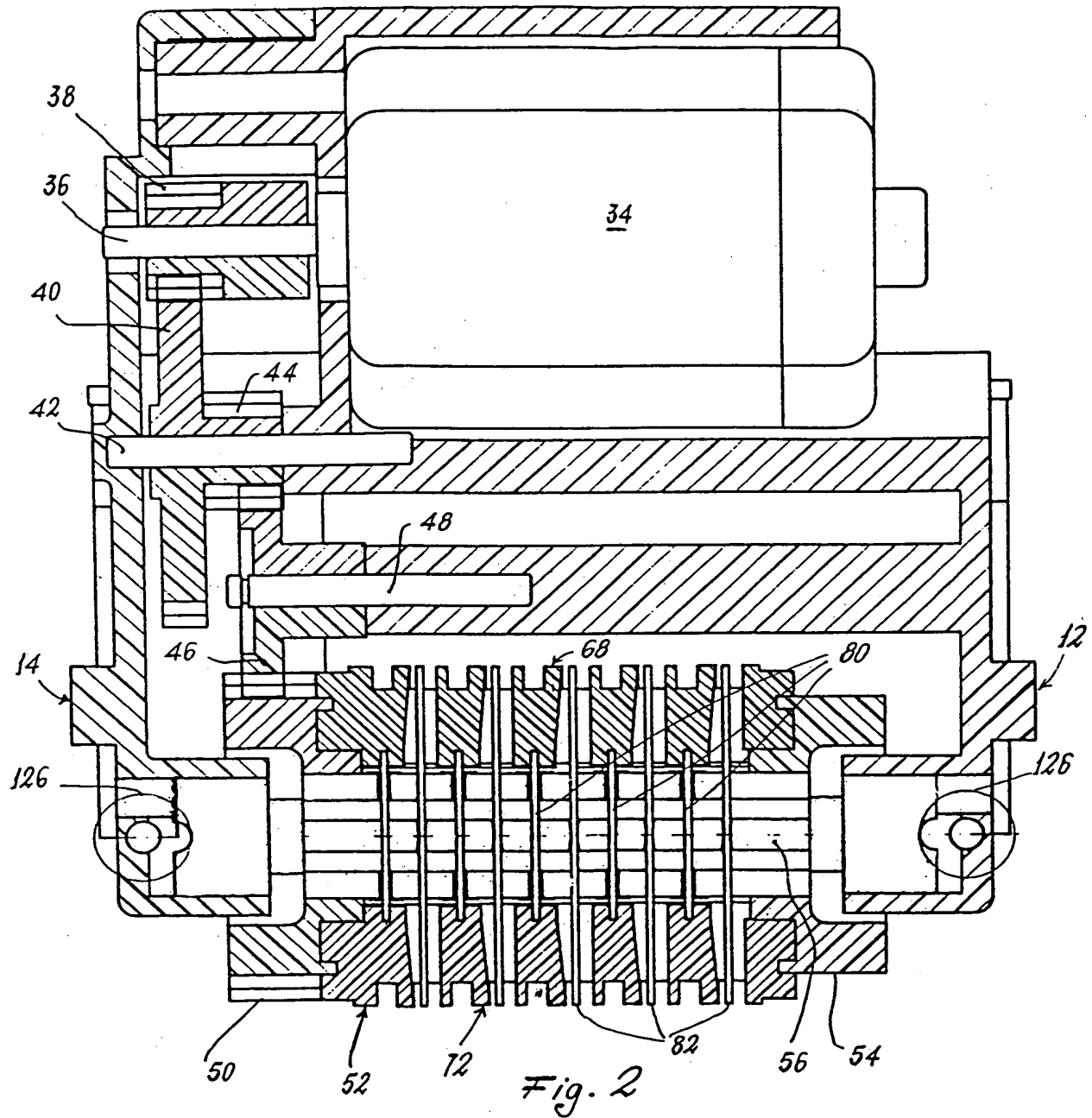
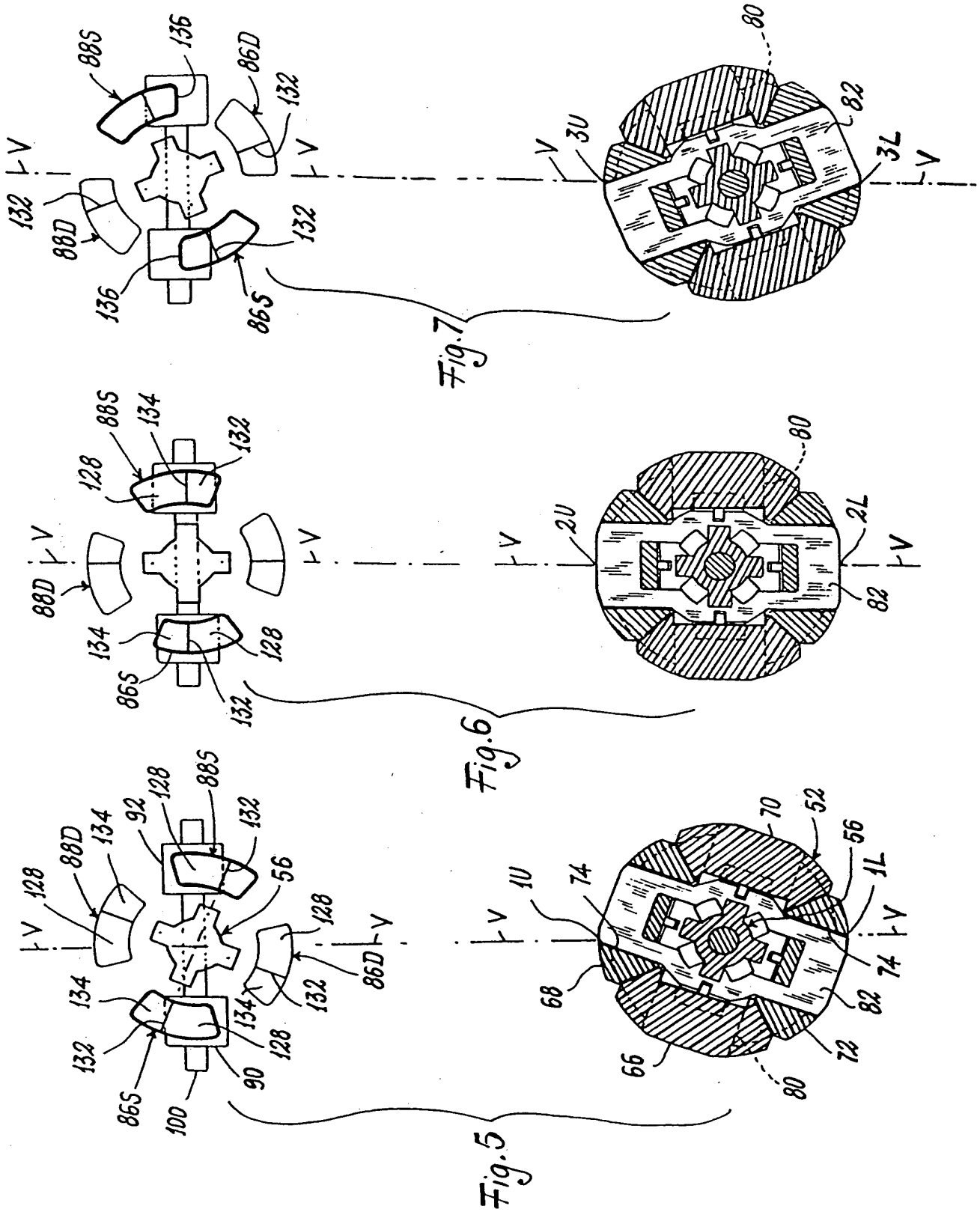


Fig. 1

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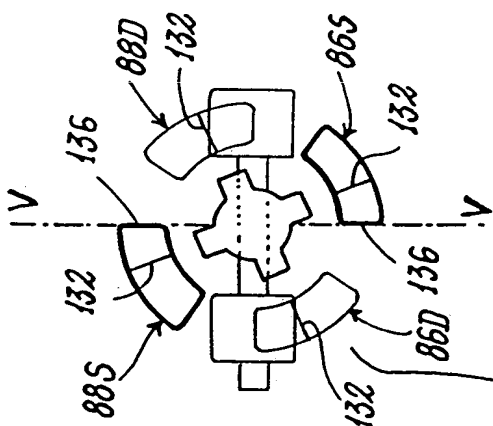


Fig. 8

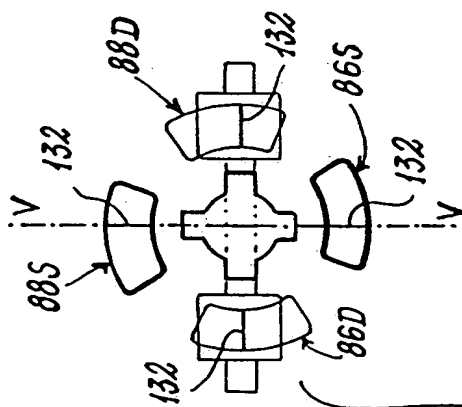


Fig. 9

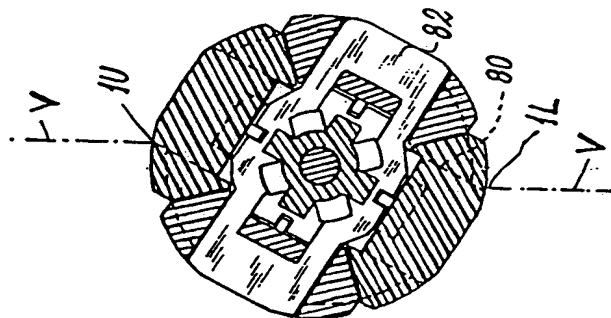
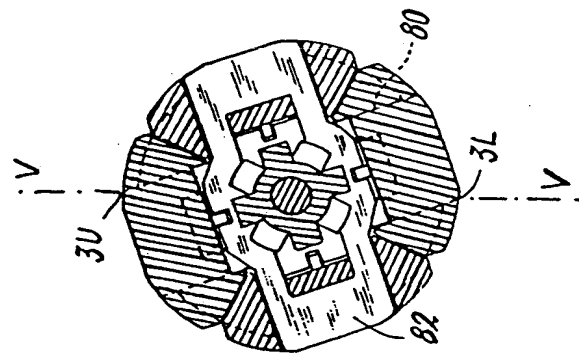
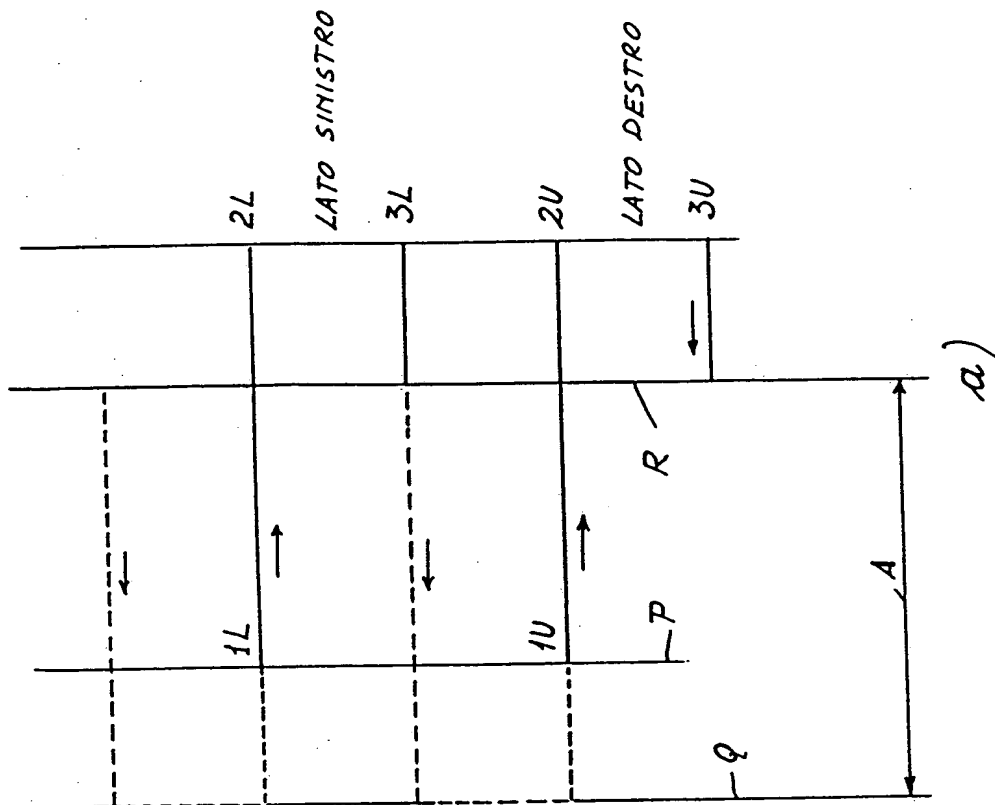


Fig. 10



PIASTRINE 82



a)

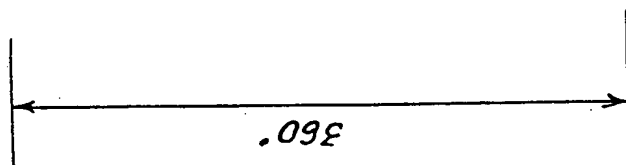
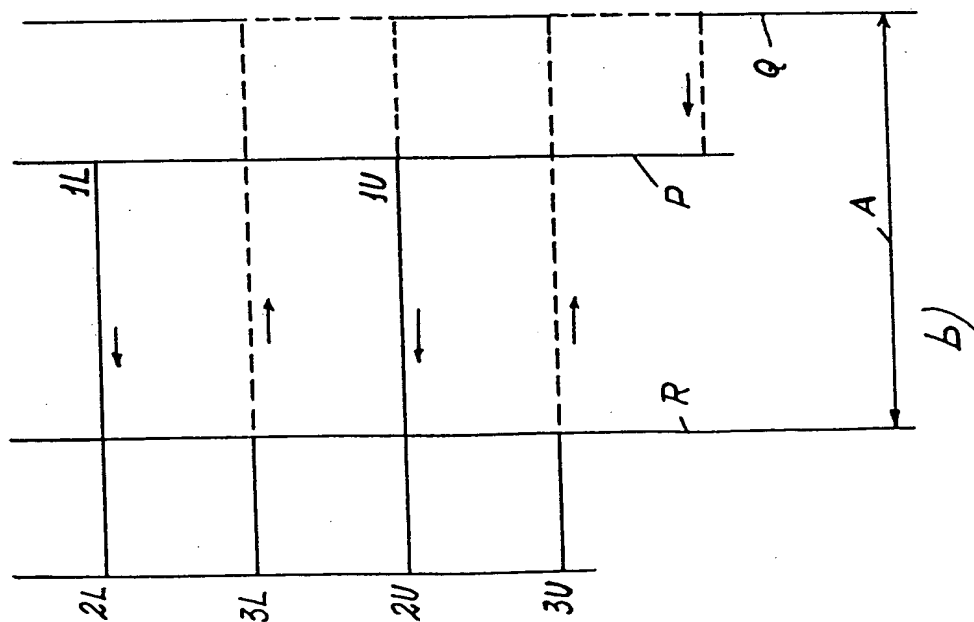


Fig. 11

PIASTRINE 80



b)

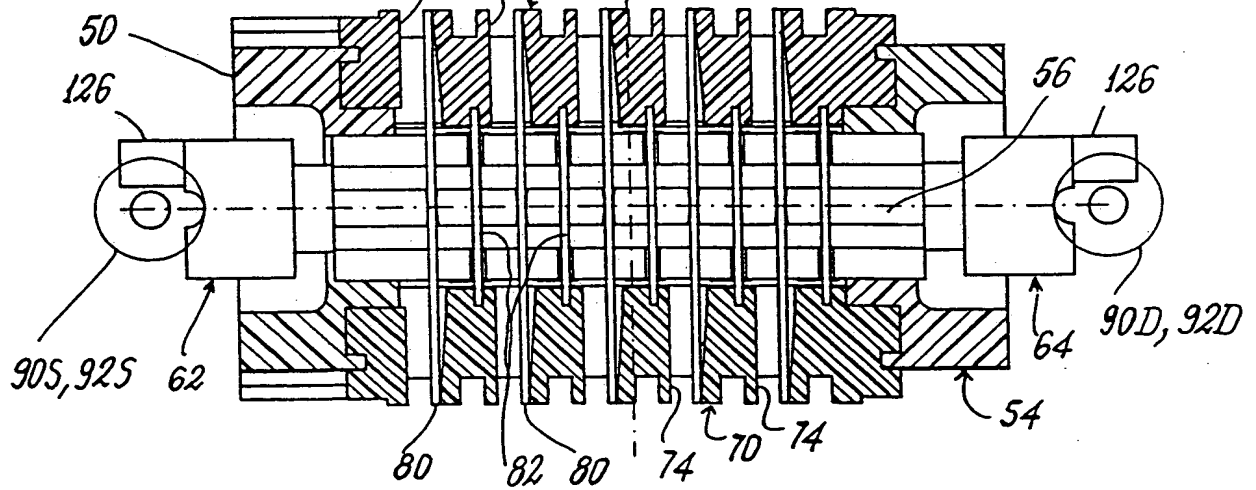
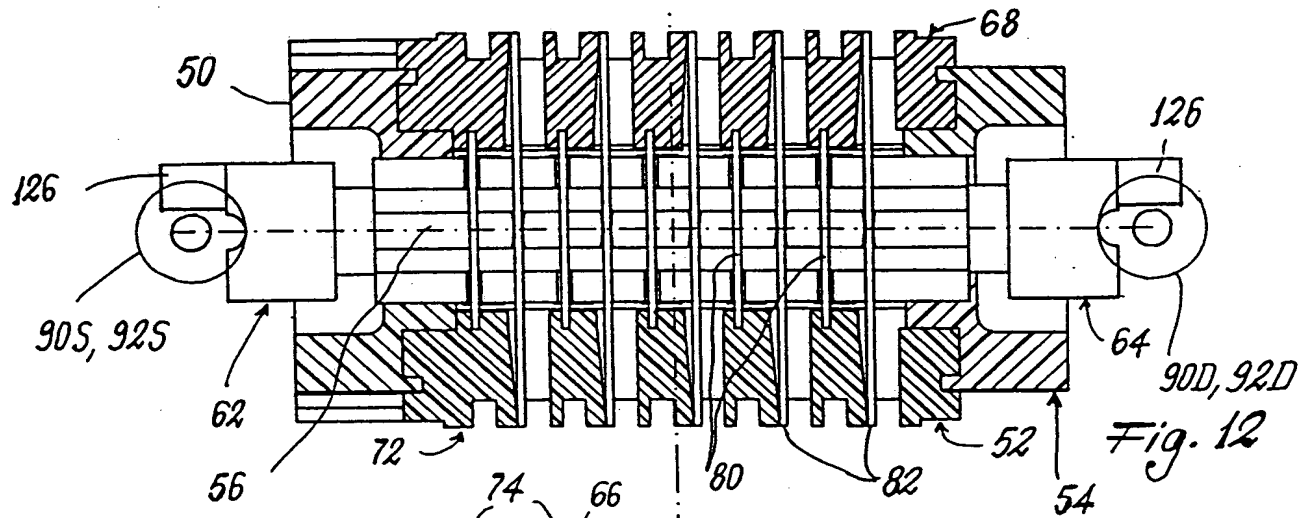


Fig. 13

